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Trees Carbon Sequestration of Different Reclamation Patterns in Antaibao Opencast Mine, Shanxi, China

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Reforestation is often the preferred method for reclamation of mined land because of the rapid production of biomass and self-sustaining topsoil, as well as for controlling erosion; recovery of reclaimed vegetation also has a great benefit for carbon sequestration. Using the permanent plots (1 hm^2 for each plot) of three different reclamation patterns carried out at the same time (1992) at Antaibao (ATB) opencast mine, carbon sequestration was studied using the forest stock volume formula method. The three plots consisted of mixed plantings of the following tree species: Plot *SIII*: Locust (*Robinia pseudoacacia*), elm (*Ulmus pumila*), heaven tree (*Ailanthus altissima*) mixed forest; Plot *SIV*: locust-pine (*Pinus tabuliformis*) mixed forest; and Plot *SV*: pure locust forest. . The results showed that S*IV* has the highest density of tree volume, reached 45.00 m^3/hm^2. The tree volume density of S*III* was 24.39 m^3/hm^2 and that of S*V* was 21.44 m^3/hm^2. Accordingly, carbon sequestration among these plots was in the order S*IV*>S*III*>S*V*. S*IV* has the highest carbon density, 27.54 t/hm^2, which is higher than the national average carbon density of artificial forests (22.17 t/hm^2), but lower than the average artificial forest carbon density in Shanxi Province (31.75 t/hm^2), and S*V* has the lowest carbon density of 17.95 t/hm^2. The mixed forest showed an obvious higher carbon sequestration capacity than the pure forest which is in agreement with our previous study results on the plots. Between the two mixed forests, locust-pine pattern is better than locust-elm-heaven tree pattern in carbon sequestration capacity, indicating that rational or scientific configuration of tree species in accordance with the tree species' growth characteristics and interactions between species are important considerations in reclamation decisions.

REFERENCES

Fehrmann L, Lehtonen A, Kleinn C, Tomppo R. 2008. Comparison of linear and mixed-effect regression models and a k-nearest neighbor approach for estimation of single-tree biomass. Can. J. For. Res., 38: 1-9.

Frouz J, Pizˇl V, Cienciala E, Kalcˇı´k J. 2009. Carbon storage in post-mining forest soil, the role of tree biomass and soil bioturbation. Biogeochemistry, 94:111–121.

Tian H, Mellilo JM, Kichilghter DW, McGuire AD, Helfrich JVK, Moore B. 1998. Effects of inter-annual climate variability on carbon storage in Amazonian ecosystem. Nature, 396: 664-667.